CHAPTER II

PROJECT AREA

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2.1 NATURAL CONDITIONS

2.1.1 Geography

The province of Misamis Occidental is geographically divided into two parts, namely a high mountainous range on the west and a flat alluvial plain on the east. This flat plain stretches from northeast to southwest along the Panguil Bay. Facing this Panguil Bay, Ozamis city and Tangub city lie in the gently sloping coastal plain of about 10 - 15 km in width. To the west of the Panguil Bay, the mountainous range mentioned above is extending beyond the Pioneer mining site except in some limited rolling areas around Molave and Switch where coconut plantations are developed. Like at the Panguil Bay, the flat alluvial plains cover the coastal area of the Illana Bay, and Pagadian city is located in this coastal plain. The project road starts from Tangub city, passes through comparatively flat area, gradually ascends the rolling hill around Switch, and then passes the mountainous area near Midsalip and the mine site.

2.1.2 Climate

The project area is located to the south of Misamis Occidental and the east of Zamboanga del Sur where rainfall is relatively abundant.

The annual precipitation averages 2000 mm, and the heviest rainfall occurs in the months of October, November and December, having monthly rainfall of about 300 mm. The driest months are February, March and April. Located outside the typhoon-attack-zone, the project area is seldom affected by severe climate, but lower areas near the creeks and small rivers are easily inundated by strong rainfalls in the rainy seasons.

2.1.3 Marine Conditions

The Panguil Bay projects 15 km deep inside the Iligan Bay with a narrow width of 3 km. Since the Iligan Bay faces the Mindanao Sea which is surrounded by Negros Island and the Surigao penisula of Mindanao, the waves generated inside the Mindanao sea cannot be developed to big sea and swell, so that the wave climate in the Panguil Bay is considerably calm throughout the year. In spite of the small tidal elevation ranging from 0 to 1.2 m, the peculiar shape of the Panguil Bay produces remarkably high speed of tidal currents exceeding 2.2 knots at flooding and ebbing tides.

2.1.4 Soil

The soils of the project area are grouped into seven, namely: Jassan clay loam, Camiguin clay loam, Bantog clay, Hydrosol, Mountain soil, Adtuyon clay and San Mannuel clay loam.

i) Jasaan clay loam

This soil type is found along both sides of the road between Ozamis City and the town of Tangub. It has an area of about 6,387.22 hectares or 3.29 per cent of the provincial area of Misamis Occidental.

The clay loam surface soil is light brown, columnar in structure, slightly friable and moderatly compact. It contains a fair amount of organic matter. Roots can easily penetrate this layer. A few stones and boulders are embedded in the surface soil. The depth ranges from 30 to 35 centimetres. A clear and smooth boundary separates the surface soil from the subsoil.

The subsoil consists of two layers. The lower boundary of the upper subsoil is about 40 centimetres from the surface. The upper layer consists of light brown to reddish brown clay with a columnar structure. It is moderately compact but nonetheless affords easy root penetration. The lower subsoil, with its upper and lower limits of 50 and 60 centimetres from the surface, respectively, consists of brown to reddish brown clay loam, of massive structure and is loose and very friable. Occasional boulders of andesite and basalt are embedded in this layer.

The substratum is reddish brown clay loam. Its depth reaches to about 100 centimetres from the surface. The soil in this layer is massive in structure, loose and very friable. A few gravels and stones are found in this horizon.

ii) Camijuin clay loam

This soil type is found on the gently rolling to hilly and mountainous areas on the coast at sitios Bucator and Makilao to the interior around the vicinity of Lantawan Peak. From this point the soil type extends northwest to sitios Balintawak

and Cavinte. Its aggregate area is 11,145.70 hectares or 5.75 per cent of the total area of the province. The elevation ranges from 15 to 300 meters above sea level.

The surface soil is about 25 centimetres deep, light brown to dark brown clay loam. The soil structure is medium granular. It is hard when dry, sticky and moderately plastic when wet. Root penetration is fairly easy. This layer contains a fair amount of organic matter. A clear and smooth boundaty separates this layer from the subsoil.

The subsoil consists of two layers. The upper layer is about 30 centimeters thick or the top and bottom boundaries are 25 and 55 centimeters from the surface, respectively. It is light brown to brown clay, and is columnar in structure. The soil is compact and hard when dry. Roots can fairly penetrate this horizon. It is poor in organic matter content. The lower layer of the subsoil is about 15 centimetres thick or the top and bottom boundaries are 55 and 70 centimetres from the surface, respectively. It is light brown to reddish brown clay and has a columnar structure. A few sandstone gravels are embedded in this layer. A diffuse boundary separates this layer from the underlying horizon.

The substratum also consists of two layers. The upper layer is about 30 centimeters thick or the

top and bottom boundaries are 70 and 100 centimeters from the surface, respectively. It is brown to reddish brown clay loam to sandy loam with a massive structure. Sandstone gravels and a few stones are embedded in this layer. It is separated by a clear and smooth boundary from the lower substratum. The lower substratum extends to a depth of 100 to 150 centimetres from the surface. It is light brown to reddish brown clay loam to sandy loam. Brick red and dark brown weathered sandstone is found in this layer. The soil has a massive structure.

iii) Bantog clay

The soil type is one of the best rice lands in the province. It occupies the coastal areas around Jimenez, Tudela, Clarin, Ozamis City, and the barrios of Bagumbang and Migpangi, Municipality of Bonifacio. It has approximately 5,214 hectares.

The surface soil is clay; dark reddish brown; friable, granular; slightly sticky and plastic. Depth is from 25 to 30 centimeters. This is underlain by a reddish brown to dark red, granular, slightly plastic and sticky, and slightly compact clay. This layer overlies a reddish brown, plastic and sticky clay. In areas which are used as rice land the subsoil is mottled red.

Bantog soils are suitable for plantation of rice and other crops. Coconut occupies a big area.

iv) Hydrosol

Swamps and marshes cover about 3,355.50 hectares or 1.73 percent of the area of the province. This represents the water-logged and marshy areas along the coast friging the mouths of rivers and creeks.

Mangrove, nipa palms, api-api, and other water-loving plants comprise the vegetation. This area is of no agricultural value but it nonetheless contributes much to the economy of the province. Some sections are ideal sites for fishponds and these are being developed for bangus cluture. Nipa palms are also cultured on a commercial scale, the fronds of which are used for thatching materials and the sap made into vinegar or liquor. Bakauan trees are cut and sold as firewood or even as material for the manufacture of furniture.

v) Mountain soils, undifferentiated

This miscellaneous land type is inaccessible because of rugged terrain, thick forest, lack of trails, and/or lack of guides. The area of this land type is about 52,088.68 hectares or about 26.86 per cent of the provincial area. It covers the entire Malindang Mountain range.

vi) Adtuyon clay

This type of soil covers the southern tip of the province, from the barrio of Masaba at the foot of Mt. Malindang to the Aloran-Jimenex Municipal boundaty. The southern portion is drained by the Usugan and Bagumbang Rivers which empty into Panguil Bay. The Segatic-gamay and Palilan Rivers drain the central and northern portions, respectively. Its aggregate area is 25,019.05 hectares or 12.90 per cent of the total provincial area.

The typical profile characteristics of this type of soil are as follows:

Depth (cm)	Characteristics
0 - 25	Surface soil, clay; light brown to dark brown or reddish brown; grainable. Boundary with subsoil is smooth and gradual.
25 - 80	Subsoil, clay; dark reddish brown; prismatic to granular structure; sticky and plastic when wet, brittle and hard when dry.
80 - 150	Substratum, clay; light reddish brown to dark yellowish brown; hard and cloddy when dry; slightly compact. Partially weathered igneous rocks are found in this layer.

vii) San Manuel sandy loam

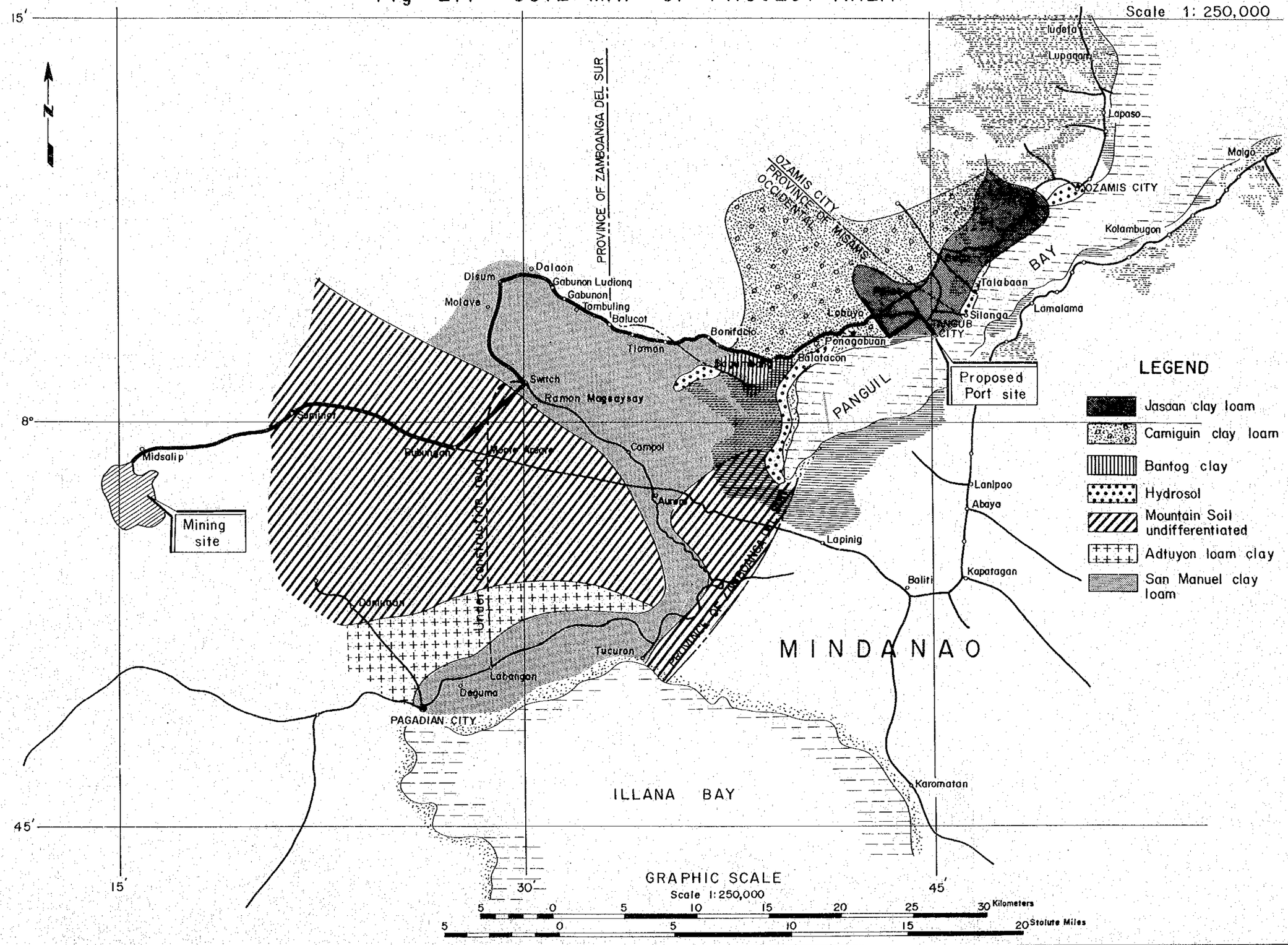
This soil type is found in the level areas along the road between Barrio Mansabay and Lopez-Jaena. It covers about 107 hectares or 0.05 per cent of the total provincial area.

The sandy loam surface soil is about 25 to 40 centimetres deep. It is light brown to grayish brown, friable with coarse granular structure. It is slightly compact. At optimum moisture condition, it is easily cultivated. Reddish brown streals indicate that the area is under water during most of the year.

The subsoil reaches to a lower depth of about 70 centimeters from the surface. It is light brown to brownish gray silt loam with yellowish brown streaks.

The subtratum starts at about 70 centimetres and extends to about 150 centimetres from the surface. It is sandy loam to sand in texture, yellowish brown to light reddish brown, loose and porous. Sometimes this horizon reaches a lower depth of about two meters from the surface.

Fig 2.1 SOIL MAP OF PROJECT AREA



2.2 SOCIAL AND ECONOMIC CONDITIONS

2.2.1 Population

The recent census revealed the population of four different provinces of the project area. The population in 1970 and 1975, together with the annual average growth rate between 1970 and 1975 is shown on the table 2.1.

Table 2.1 POPULATION AND ANNUAL AVERAGE GROWTH RATES IN THE PROVINCES AROUND PROJECT AREA

Province	Population		Annual Av. Growth Rate (%)
	1970	1975	
MISAMIS OCCIDENTAL	320,000	356,000	2.2
ZAMBOANGA DEL SUR	890,000	1,003,000	2.4
LANAO DEL NORTE	350,000	368,000	1.1
MISAMIS ORIENTAL	473,000	558,000	3.6

The most rapid annual average growth rate was 3.6% in the province of Misamis Oriental and the slowest one was 1.1% in Lanao del Norte. It is generally said that the rapid growth in Mismis Oriental is mostly attributed to remarkably fast development of industrial and commercial sectors in Cagayan de Oro, the capital of Misamis Oriental, whereas the slow growth in Lanao del Norte results from stagnant agricultural development. The province of Misamis Occidental which covers the east half of the project area had a moderate population growth rate of 2.2% per annum. The population distributions of the major cities in Misamis Occidental in 1970 and 1975 are shown in Table 2.2.

Table 2.2 POPULATION AND ANNUAL AVERAGE GROWTH RATES OF MAJOR CITIES IN OZAMIS OCCIDENTAL

Major Cities	Population		Annual Av. Growth Rate(%)
	1970	1975	
Ozamis	64.643	71.559	2.0
Oroquieta	38.575	42.497	2.0
Tangub	30.918	40.461	5.5
Plaridel	21.627	22.052	0.4
Aloran	18.540	20.515	2.0
Bonifacio	16.095	20.398	4.9

Oroquieta, the capital of the province of Misamis Occidental, is the second populated city, next to Ozamis city which had the largest population of 72,000 in 1975. As to the population growth rate, Tangub city ranked first with an annual growth rate of 5.5% followed by Bonifacio town with a rate of 4.9% per annum. As far as the population is concerned, Tangub and Bonifacio are regarded as most promising towns.

The west half of the project area is covered by the province of Zamboanga del Sur whose major cities and towns related to the project road are Labangan, Midsalip, Molave and Aurora.

Table 2.3 POPULATION AND ANNUAL AVERAGE GROWTH RATES OF MAJOR PROJECT RELATED CITIES IN ZAMBOANGA DEL SUR

Major Cities	Population		Annual Av. Growth Rate(%)
	1970	1975	
Midsalip	19.397	20.927	4.4
Molave	21.579	22.363	1.0
Aurora	25.975	31.092	3.6
Labangan	15.965	16.257	0.5

The Midsalip town, the entrance of the project private road, also had a high growth rate of 4.4%. On the whole, the cities and towns along the project road appear to be relatively active when compared with other cities in the provices.

2.2.2 Major Industries (Agriculture)

According to the 1975 census, more than half of the workers employed were engaged in primary industries such as, agriculture, fishing and forestry. Farmers and Fishermen accounted for 65.9% in Misamis Occidental and 72.5% in Zamboanga del Sur.

Table 2.4 POPULATION CLASSIFIED BY GAINFUL OCCUPATION IN 1975

Occupation	Misamis Occidental (%)	Zamboanga del Sur (%)	Misamis Oriental (%)
Farmers & Fishermen	65.9	72.5	56.2
Craftsmen & Production process workers	6.5	4.7	9.5
Service	6.1	4.5	8.0
Sales workers	6.8	6.1	7.9
Technical Workers	5.6	3.9	4.9
Transport & Communication	3.4	2.4	4.1
Freight handlers	1.8	1.7	3.2
Clerical workers	2.1	1.8	2.6
Managerical workers	0.7	0.5	1.5
Miner	-	0.2	0.3
Others	1.1	1.7	1.8
	100.0	100.0	100.0

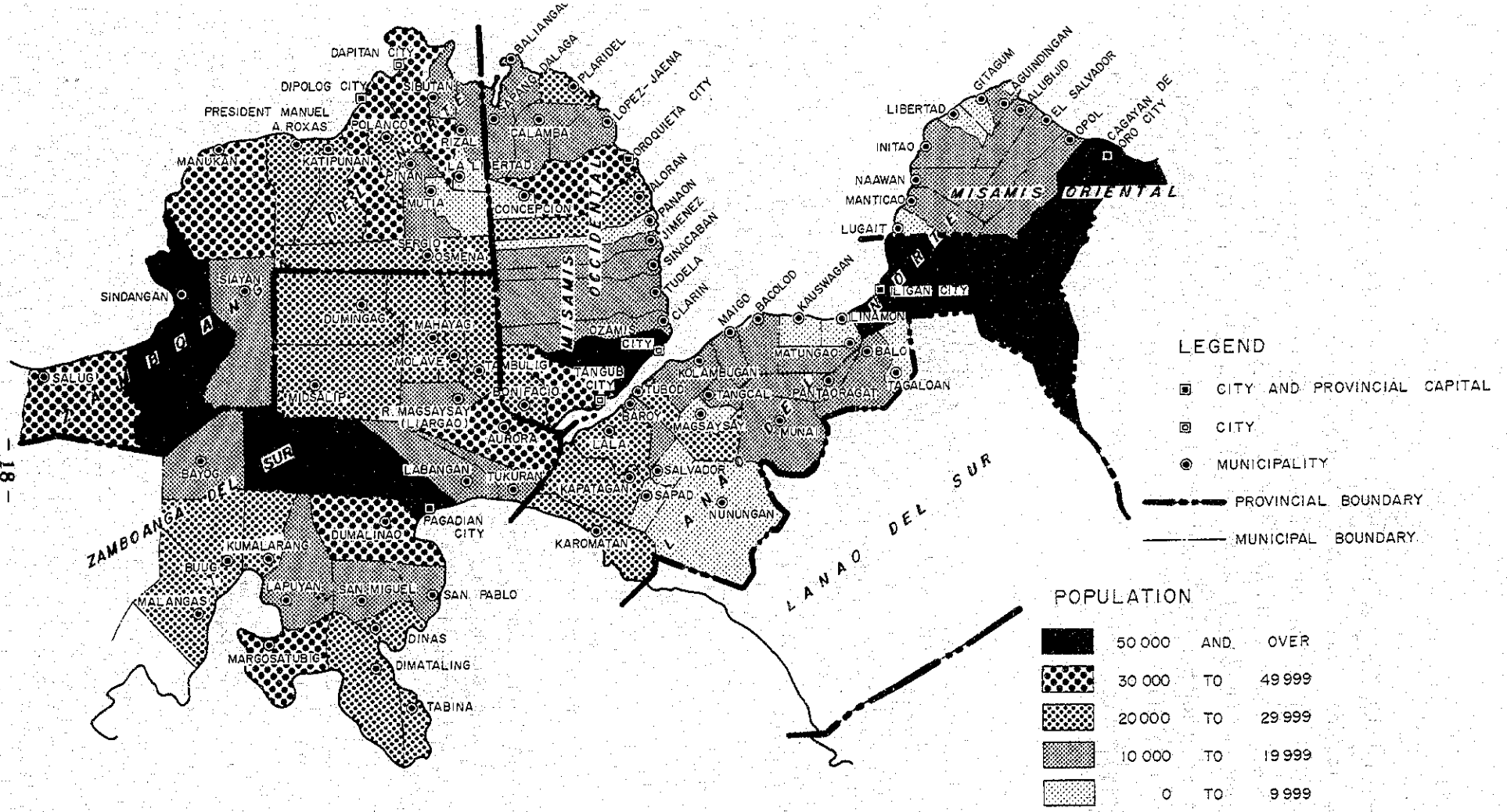


Fig. 2.2 POPULATION DISTRIBUTION AROUND PROJECT AREA

The major agricultural products harvested in the project area are rice, corn, coconut, banana and pineapple. Of all the products, coconut constitutes about 40 - 70% in the above mentioned provinces. The annual growth rate of major agricultural products is given on table 2.5. This agricultural growth rate appears to be less than those of population in the project area, so if this agricultural growth rate do not increase, there would be no self sufficiency of food in each province.

Table 2.5 ANNUAL GROWTH RATES OF MAJOR AGRICULTURAL PRODUCTS IN 1975 IN MINDANAO

Crops	Annual Growth Rate
Palay	2.5%
Corn	2.0
Coconut	0
Banana	1.5
Pineapple	1.0
Vegetable	3.0
All crops	2.1

Like other cities in the project area, self sufficiency of rice and corn in Ozamis city was as low as 54.1% in 1975, and most of the necessary products were imported mainly from Cebu city. The major plantations of coconut in Ozamis Occidental are developed along the coastal plain between Tangub and Ozamis city. About 20,000 tons of coconut oil are produced annually from this vast plantation of 15,000 ha. Besides this plantation, other large-scale plantations are being developed in the vicinity of Switch and Monte Alegre with an area of about 22,000 ha. Though not having

reached a maximum production rate of 1300 kg/ha, maximum annual production of 30,000 ton of coconut oil will be achieved in the near future.

Several logging companies are in operation in Misamis Occidental and Zamboanga del Sur.

Table 2.6 LUMBER PRODUCTION IN MISAMIS OCCIDENTAL AND ZAMBOANGA DEL SUR (unit:m^3)

Company's name	1978	1979
Misamis Lumber Co.	8,298	36,000
Elsalvador Logging Co.	21,597	54,180
Zamboanga del Sur Timber Co.	18,533	65,000
Kawasado	-	60,584
Montimula	-	33,375

The Misamis Lumber Co. transports the logs to the Pogadian port, but the rest of the companies ship the logs at Kumalarang port. Most of the logs are transshiped to the Cotabato city and Davao city for proceesing into timber. Geographically speaking most of the commercial forest is in the west of Pagadian port, so that Tangub port and Ozamis port will have a slight chance of handling logs and timbers in future.

Panguil Bay is the Communal fishing ground of three provinces, namely; Zamboanga del Sur, Zamboanga del Norte and Misamis Occidental. Though once being a considerably rich fishing ground, at present, due to excessive fishing the fishing industry has become subsistence fishing rather than commercial fishing. The shortage of fish in the cities of Ozamis and Tangub is supplied from Zamboanga del Norte (Dipolog City) and Zamboanga del Sur (Tukuran).

The industries other than agriculture, fishery and forestry such as commercial and industrial sectors seem to be under developed for the time being. However, it is anticipated that light industry in connection with agricultural and forest products (soap, timber) will be developed following the industrialization of surrounding provinces.

CHAPTER III

TRAFFIC IN THE PROJECT AREA

CHAPTER III

TRAFFIC IN THE PROJECT AREA

3.1 INLAND TRAFFIC

3.1.1 Traffic Survey

In traffic patterns, the existing inland traffic on the project road can be separated into two sections. One is the traffic between Midsalip and Switch/Molave and the other between Switch/Bnifacio and Tangub. The former section is, at present, placed in the hinterland of Pagadian port, while the latter section is included in the economic zone of Ozamis port. There are two main reasons for dividing it into two sections. One reason is that the inland transportation cost is less, and the other reason is that the existing road condition between Bonifacio and Liloall is too poor and the car generally slip during rainy season.

To obtain a general information as to the characteristics of the present and future traffic on the project road, traffic survey has been conducted on the three points along the project road and project related road, namely; between Ozamis and Tangub, between Tangub and Switch and in the vicinity of Suminot. This traffic survey (traffic count) was conducted continuously from 7:00 a.m. to 7:00 p.m. on 20, 23 April 1979. This 12 hours-traffic was extrapolated into average daily traffic (ADT) by applying a multipler of conversion factor 1.2.

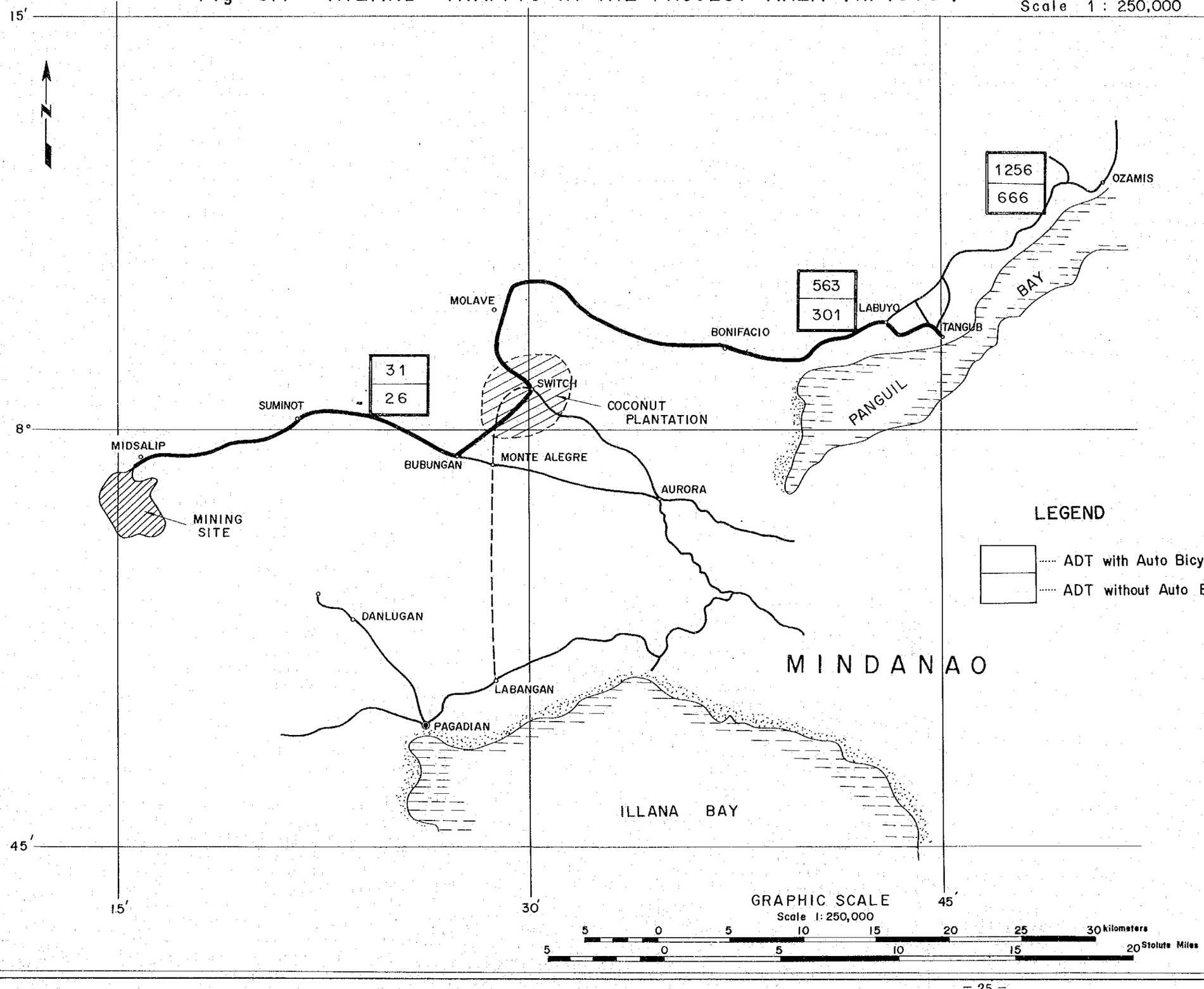
Table 3.1 AVERAGE DAILY TRAFFIC ON THE PROJECT ROAD

	Location	Date surveyed	wea-ther	Auto Bicycle	Car	Light Truck	Heavy Truck	Small Bus	Big Bus	Total
SECTION A	Tangub - Ozamis	Apr.20'79	fine	590	100	196	108	212	50	*(1,256) 666
SECTION B	Tangub - Switch	Apr.23'79	fine	262	5	82	79	89	46	*(563) 301
SECTION C	Suminot	Apr.24'79	fine	5					26	*(31) 26

Auto Bicycle : motor cycle, tricycle
Car : car, jeep, taxi, pick up van
Light Truck : truck with a loading capacity less than 4^{t}
Heavy Truck : truck with a loading capacity over 5^{t}
Small Bus : bus with seat capacity less than 30 nos.
Big Bus : bus with seat capacity over 31 nos.
*The figure in the parenthesis is ADT with Auto Bicycle.

Fig 3.1 INLAND TRAFFIC IN THE PROJECT AREA (in 1979)

Scale 1 : 250,000



3.1.2 Observations on Traffic Survey

Generally, it was observed that the traffic consisted mostly of trucks and buses, representing 85% of the total traffic (exclusive of auto bicycles) between Tangub and Ozamis, 98% between Tangub and Switch, 100% at Suminot. This vehicle composition presents some definite distinction from other major cities in neighboring provinces. According to the recent traffic survey conducted at Agusan area of Misamis Oriental and at Sultan of South Cotabato by other Consultants, the traffic of bus and truck accounted for around 5% and 20 - 30% respectively, while the traffic of car constituted more than 60% on both areas. One of the reason for this superiority of bus/truck traffic on the project road is that Ozamis port produces a great magnitude of port related traffic.

The inbound and outbound commodities at Ozamis port was in the order of 220,000 ton in 1978. These commodities move to and from both the area of Tangub-side and the area of Oroquieta-side. The port commodities to and from the area of Tangub side has been figured out according to the following assumption;

1. The share of agricultural products in Tangub side has been determined in proportion to the area of plantation or cultivated land.

2. Other goods in Tangub side has been determined in proportion to the populations of cities and towns.

As a result of the calculation, the total commodities to and from the Tangub-side are estimated at 55,600 ton/year in 1978. On the other hand, the traffic survey revealed the vehicle composition of trucks as follows;

Heavy truck : Light truck = 1 : 2

Based on this vehicle composition and the actual loading factors of 50%, ADT of trucks are calculated as follows:

$$\text{Heavy Trucks} \ldots\ \frac{55{,}600 \times \frac{1}{3} \times 2}{365 \times 8 \times 0.5} = 25.3 \text{ ADT}$$

$$\text{Light Trucks} \ldots\ \frac{55{,}600 \times \frac{2}{3} \times 2}{365 \times 4 \times 0.5} = 101.6 \text{ ADT}$$

Total Traffic ≒ 127 ADT

As compared with the recent traffic survey, this port-related ADT of 127 accounts for 42% of the all traffics between the section of Tangub and Ozamis. Though this analysis may be preliminary, the excessive involvement of trucks on the project road can be basically explained. In addition to truck traffics, the bus traffics on the project road also shares large portion, compared with the surrounding cities in Mindanao. This is due to the bad road condition unsuitable for average cars of sedan type to run and also due to the lower level of income of the people living in this region. One more distinction is that the traffics of 2 or 3 wheel-vehicles such as motor cycles and tricycles are as large as those of other 4 wheel vehicles.

As the project road runs away from town of Ozamis and Tangub, the total volume of traffic gradually decreases to nearly a half in the vicinity of Bonifacio.
From the vehicle composition view point, traffic by light truck decreases and becomes almost the same as that of heavy truck traffic in number. The traffic of cars diminish, but the share of buses remains unchanged. This shows that, at present the passenger traffic are fully dependent on bus transportation system throughout the project road.

At the present moment, small amount of agricultural

products, logs and consumer goods are transported from Pagadian port to this less traffic area. In near future, however, it is expected that the coconut plantation around Switch area will yield a lot of traffic to either Pagadian or Tangub new port.

The number of passengers for each type of vehicles had been surveyed in the vicinity of the project area by other consultants in 1976. Incorporating this data into the results of ADT on Table 3.1, the passengers carried on the project road are estimated as follows:

Table 3.2 AVERAGE NUMBER OF PERSONS PER VEHICLES

Vehicle Type	Misamis Oriental	Mindanao	Cebu
Car	3.40	3.42	3.28
Small Bus	22.5	32.0	36
Large Bus	45.2	-	-
Truck	3.52	4.0	4.1

Table 3.3 DAILY PASSENGER PER VEHICLES ASSUMED

Vehicle Type	SECTION A Ozamis - Tangub	SECTION B Tangub - Switch	SECTION C Suminot
Car	342	17	-
Small Bus	4,770	2,002	-
Large Bus	2,260	2,080	1,175
Truck	1,070	567	-
Total	8,442	4,666	1,175

3.2 COASTAL TRAFFIC

In the vicinity of the proposed berth site at Tangub city (Tangub port site), there is no port facilities except for a small slip for car ferry service. Within the project area, there are two ports, namely: Ozamis port in the west of the entrance of Panguil Bay and Pagadian port in the northwest of the Illana Bay. The Ozamis port, located about 16 km away from the Tangub berth site, functions as a sub port of Iligan port of Lanao del Norte, dealing with most of port commodities of Misamis Occidental. According to the port statistics in 1978, inbound trade was about 94,000 ton and outbound trade was about 116,000 ton, totaling 210,000 ton. Of all outbound commodities, agricultural products such as copra, rice and corn constitutes 65% or 76,100 ton, while major inbound commodities are 33,200 ton of general cargo, 14,000 ton of cement and 14,200 ton of bottle cargo. Most of the inbound commodities are transported from Cebu city or much farther area by freighters of 1,000 - 2,000 DWT class. Some commodities like cement and other construction materials come from Iligan port by coastal vessels of 500 ton and under. As to foreign trade 12,000 tons of logs were exported, which is equal to 1/20 of domestic trade.
Though the passenger piers are congested with small passenger boats, overall berth occupancy inclusive of general cargo berths is less than 40%. The frequency of ship calling of 1000 DWT class vessels was 10 times a month, the total being 120 times a year in 1978. The vessels of 500 DWT and under passed much more times.

The Iligan port which is the base port of Ozamis port handled about 246,000 ton of domestic trade in 1978. The major commodities were such consumer goods such as cereals, sugar and bottles cargo, occupying as large as 60,000 ton, or 54% of all incoming goods. Top outbound commodities were 53,200 tons of chemicals, followed by 17,500 tons of corn.

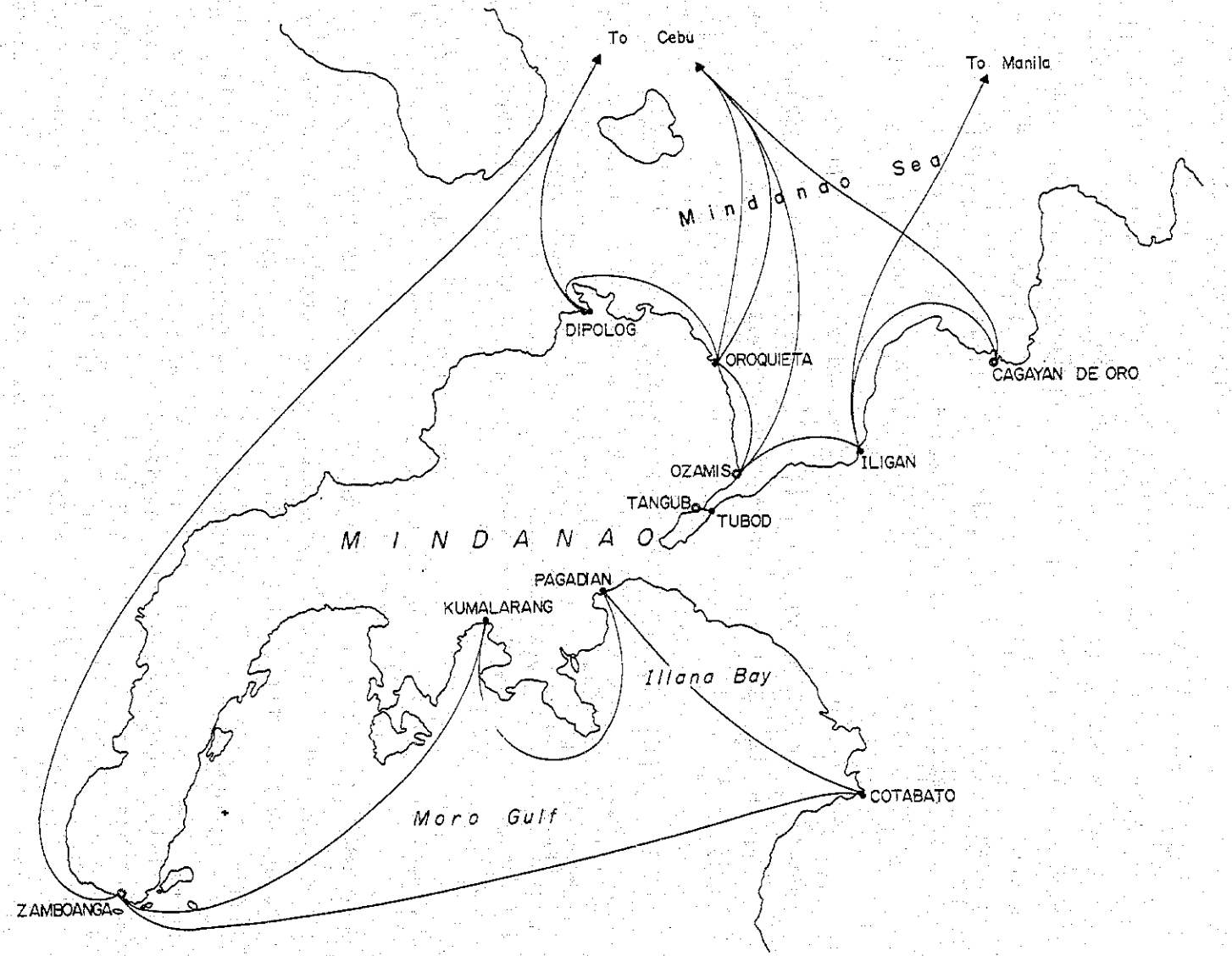
Generally, the share of manufactured and chemical goods is larger than that of other average ports. This tendency can also be seen in foreign trade. Of all foreign trades of 50,000 ton, chemicals ranked first. According to the port statistics, it is understood that the major destinations and origins of port commodities are Cebu city and Manila city.

The coastal trade is linked to the neighboring ports, Ozamis, Oroquieta and Cagayan de Oro. The regular passenger boat service is also operated between Iligan port and Ozamis/ Oroquieta port. On completion of the new Tangub port, it is expected that some of the passengers travelling through Tangub-Ozamis-Iligan route will use this new direct route between Tangub and Iligan port. As present, 500 DWT car ferry boats shuttle between Tangub and Tubod, crossing the Pangail Bay in about 30 minutes travel. This car ferry boat service is operated under four round trips a day, and usually carries 10 trucks plus 20 - 30 passengers in one trip. Some of the passengers without vehicles on this line will also use the new passenger boat service from Tangub new berth and Iligan port, if the conditions of fares are satisfactory.

The third project-related port is the Pagadian port which is located in the Illana Bay. This Illana Bay lies on the opposite side of Panguil Bay, the former is open to the Celebes Sea and the latter to the Mindanao Sea. The Pagadian port, unlike the other two project-related ports, has much greater links to the ports in the Moro Gulf than to Cebu city and Manila city. The major port linked with the Pagadian port is Zamboanga city, Cotabato city and Davao city. According to the port statistics of Pagadian port in 1978, inbound trade was 41,800 ton and outbound trade was 40,900 ton. The major commodities of outbound trade was rice and corn, 21,000 ton in total, representing 51% of all outbound

trade. On the other hand, major inbound commodities were 13,200 ton of bottles, 12,300 tons of general cargo and 4,100 tons of sugar. Unlike other ports in Mindanao, the share of Copra trade in this port is very small, accounting for 2.5% of all trade.

Fig. 3.2 EXISTING SEAWAY AROUND PROJECT PORT



3.3 TRAFFIC PROJECTION (INLAND)

3.3.1 Mine-Related-Traffic

The future inland traffic on the project road will consist of "mine-related-traffic" and "non-mine-related-traffic". The former traffic will accrue from the Pioneer mine site for transporting iron ore and other mine associated goods and passengers. The latter traffic is the normal traffic that will exist and expand in step with the regional socio/economic growth of the project area, regardless of the Pioneer mining exploitation.

With the start of exploitation of the Pioneer mine, the following commodities will be transported by corresponding vehicles between the Pioneer mine site and the Tangub port.

Table 3.4 MAJOR COMMODITIES FROM PIONEER MINE

Iron Ore	spare parts and others	fuel & oil	general cargo	Passengers		
				labor	domestic stuff	foreign stuff
ton/year	ton/year	kℓ/year	ton/year	person/day	person/day	person/day
300,000	300	10,000	300	200	50	5

Provided that the above commodities are transported by the following vehicles and loading conditions. The "mine-related-traffic" can be calculated on ADT level as follows:

Table 3.5 VEHICLES FOR TRANSPORTING MINING GOODS

Commodity	Vehicle	Loading condition
Iron ore	Dump Truck (12 T)	Full loaded
Spare parts	Heavy Truck (8 T)	Half loaded
Fuel	Tank lorry (12 T)	Full loaded
General Cargo	Light Truck (4 T)	Half loaded
Passenger	Sedan	-

Table 3.6 MINE-RELATED-TRAFFIC

Vehicle Type	ADT
Heavy Truck (inclusive of dump truck)	143
Light Truck	1
Car	20

This mine-related-traffic will exist only during the period of mine operation between 1982 and 1988.

3.3.2 Non-Mine-Related-Traffic

Traffic projection of passenger cars for "non-mine-related-traffic" can be calculated by applying traffic growth factors which are related to the expected growth in population, per capita income in the project area and the income elasticity of transport demand. The relationship between these factors are given in the following formula.

$$TGR = PGR + PCIGR \times E$$

where TGR : Traffic growth rate, percent per year
PGR : population growth rate
PCIGR : per capita income growth rate
E : income elasticity of transport demand

The population growth rate in future on each section of the project road has been assumed giving due consideration over the past population trend of major cities and towns enroute to the project road. (The population growth rates of major cities are discussed in chapter 2.2.1)

The coefficient of income elasticity has been assumed at 1.5 for cars and 1.3 for buses. Since no reliable data supporting these coefficients exist in the Philippines,

these parameter values have been taken from other cases in Asian Countries. Since the regional data as to income growth rate was not compiled either in the project area, this parameter values have been derived from the data on national level.

Table 3.7 TRAFFIC GROWTH RATES OF AUTO AND BUS

		Tangub - Switch	Switch - Midsalip
Auto	1980 - 1989	3.0 + 2.6 x 1.5 = 6.9	3
	1990 - 1999	2.0 + 2.6 x 1.5 = 5.9	5
Bus	1980 - 1989	3.0 + 2.6 x 1.3 = 6.4	5
	1990 - 1999	2.0 + 2.6 x 1.3 = 5.4	5

On traffic projection of trucks for "non-mine-related traffic", the traffic growth factor has been assessed in relation with the value of G.N.P. According to the statistical data, 6% of annual growth rate has been adopted.

In the meantime, an annual growth rate of car registration in the Philippins between 1966 and 1975 averaged 14%. Considering the tendency of high growth rates of car registration in the Philippines, it can be said that the assumption of traffic growth rate on the project road mentioned above is considerably conservative, sufficient enough to make preliminary traffic study.

Table 3.8 GROWTH RATES OF CAR REGISTRATION IN PHILIPPINE

	Sedan	Pick-up	Bus	Truck
Philippine	15	26	10	18
Cagayan de Oro	10	10	0	15
General Santos	16	25	26	5
Davao City	14	19	21	14

By applying the traffic growth rates to the base year traffic in 1979, traffic forecast between 1980 and 1999 has been made as shown in tables 3.9, and 3.10. In the section between Switch and Midsalip, since no traffic data except bus have been counted, the tentative vehicle compositions has been set by use of those between Switch and Tangub. On the Tangub - Switch traffic projection, after year 1985, 1% of small bus traffic has been converted into car traffic, because it is anticipated that in line with regional income growth some passenger will take taxi instead of bus.
(6.6 cars equal to 1 bus)

Table 3.9 TRAFFIC PROJECTION (TANGUB - SWITCH)

	Year	Car	Light truck	Heavy truck	Small bus	Large bus	Total
0	1979	5	82	79	89	46	301
1	1980	5	87	84	95	49	320
2	1981	6	92	89	101	52	340
3	1982	6	98	94	107	55	360
4	1983	7	104	100	114	59	384
5	1984	7	110	106	121	63	407
6	1985	7+9 (16)	116	112	129x0.99 (128)	67	431
7	1986	8+18 (26)	123	119	137x0.98 (134)	71	458
8	1987	9+29 (38)	131	126	146x0.97 (142)	76	488
9	1988	9+41 (50)	139	133	156x0.96 (150)	80	517
10	1989	10+55 (65)	147	141	166x0.95 (158)	86	550
11	1990	10+57 (67)	156	150	174x0.95 (165)	90	580
12	1991	11+61 (72)	165	159	184x0.95 (175)	95	614
13	1992	12+64 (76)	175	169	194+0.95 (184)	100	650
14	1993	12+67 (79)	185	179	204x0.95 (194)	106	686
15	1994	13+71 (84)	197	189	215x0.95 (204)	106	720
16	1995	14+75 (89)	208	201	227x0.95 (216)	111	761
17	1996	15+79 (94)	221	213	239x0.95 (227)	117	805
18	1997	15+83 (98)	234	225	252x0.95 (239)	124	850
19	1998	16+88 (104)	248	239	266x0.95 (253)	130	899
20	1999	17+92 (109)	263	253	280x0.95 (266)	137	950

The figures in parenthesis are traffic considering composition transfer from small bus to car.

Table 3.10 TRAFFIC PROJECTION (SWITCH - MIDSALIP)

	Year	Car	Truck	Bus	Total
0	1979	1	31	26	58
1	1980	1	32	27	60
2	1981	1	34	29	64
3	1982	1	35	30	66
4	1983	1	36	32	69
5	1984	1	38	33	72
6	1985	1	39	35	75
7	1986	1	41	37	79
8	1987	1	42	38	81
9	1988	1	44	40	85
10	1989	1	46	42	89
11	1990	1	49	44	94
12	1991	1	52	47	100
13	1992	2	55	49	106
14	1993	2	58	51	111
15	1994	2	61	54	117
16	1995	2	65	57	124
17	1996	2	69	60	131
18	1997	2	73	63	138
19	1998	2	78	66	146
20	1999	2	82	69	153